

Tuesday, October 24

This workshop will focus on current models of color detection mechanisms especially with regard to the relationship between classical, lower-order mechanisms (RG, BY) and higher-order mechanisms.

TuS 10:15am–12:15pm **Room: 551**

Astronomical and Space Optics

David Content, *NASA/Goddard Space Flight Ctr, USA, Presider*

TuS1 10:15am (Invited)
Optics for the NGST flight demonstration mission NEXUS, Richard Burg, *NASA Goddard Space Flight Ctr., USA.* + *Andrew Lowman*
The Nexus flight experiment will be an approximately 2.8 meter diameter telescope based on the NGST architecture. Nexus has the top-level requirement to mitigate NGST cost and risk by space validating lightweight, deployable telescope technology. The validation requirements are: validate segmented near infrared telescope in space with parameters traceable to NGST requirements; validate deployment of lightweight NGST-like mirrors; validated phasing of deployed system traceable to NGST architecture using star images; validate diffraction limited stable imaging of "science" fields. The design concept and evaluation of potential performance will be presented. Included will be a discussion of the wavefront sensing and control system and the implications this system has on optical performance.

TuS2 10:45am (Invited)
Development program for the constellation-X Soft X-ray telescope, Leon Van Spreybroeck, Lester M. Cohen, William A. Podgorski, *Smithsonian Astrophysical Observatory, USA*; Oberto Citterio, *Osservatorio Astronomico di Brera-Milano, Italy*; Stephen L. O'Dell, Robert J. Petre, *NASA, USA*.
The Constellation-X (CX) program is expected to be the next major NASA mission in X-ray Astronomy. The current plans call for four identical satellites to be placed at L2. Each satellite will carry a spectroscopy X-ray telescope (SXT) with a bandpass extending to 10 keV, a hard X-ray telescope (HXT) with a bandpass extending to at least 40 keV, reflection gratings, an X-ray calorimeter and other detectors. The total effective area for the four SXTs will be approximately 30 times that of the Chandra Observatory. The mirrors will be replicas of high precision mandrels to reduce the weight and polishing cost. Two approaches are being developed, a replicated shell approach similar to that used for the XMM/Newton project, and segmented mirrors similar to those developed for ASTRO-E. The replicated shells

of XMM/Newton have the required angular resolution, but exceed the CX weight budget by a factor of about six. The ASTRO-E mirrors satisfy the CX weight requirement, but require a factor of about four improvement to meet the CX angular resolution requirements. The development programs and progress in both areas will be described.

TuS3 11:15am
Correlation of modeling with NGST wavefront control testbed results, Paul Atcheson, Mike Lieber, *Ball Aerospace, USA*.

Many of the new telescopes depend upon use of segmented primary mirror technology to achieve large aperture imaging. This introduces an additional complexity of segment alignment and fine phasing. This paper discusses the results from correlating the NGST wavefront control testbed with analytical and simulation models.

TuS4 11:30am
Optical design trade studies for NGST, Joseph M. Howard, Pamela S. Davila, J. Eric Mentzell, Timo T. Saha, Daniel J. Schroeder, Mark Wilson, *NASA Goddard Space Flight Ctr., USA*.

Optical design trade studies are presented for NASA's Next Generation Space Telescope (NGST). The "yardstick" design for NGST is a three-mirror-anastigmat with a segmented 8m primary and active optics for wavefront control. Trade issues include parametric studies, adding a fourth powered mirror, beam steering, and coupling the telescope design with its instruments.

TuS5 11:45am
Achromatic phase control for nulling interferometry-laboratory results, R.M. Morgan, J.H. Burge, N. Woolf, *Univ. of Arizona, USA*.

In nulling interferometry, the central fringe is phase shifted to become destructive and cancel a bright central object, such as a star, allowing dimmer material to be detected. We create and control the phase shift using sets of dielectric plates analogous to achromatic lenses. We describe the experiment, control system, and experimental results towards achieving a stable null of 10,000 at 30 percent visible bandwidth.

TuS6 Noon
Progress towards segmented mirror technology for the Constellation-X soft x-ray telescope, D.A. Content, K.-W. Chan, C. Fleetwood, J. Hein, T. Madison, R. Petre, T.T. Saha, Y. Soong, C. Strojny, E. Waluschka, G.A. Wright, W. Zhang, *NASA GSFC, USA*.
We present the need for and progress towards an ultralightweight, segmented, highly nested x-ray mirror for the Constellation-X program. Emphasis

in this talk is on mandrel fabrication, mirror replication, and alignment.

TuT 10:15am–12:15pm **Room: 552**

Physics and Applications of Fourth-Generation Light Sources 2

Erik Johnson, *Brookhaven Natl. Lab., USA, Presider*

TuT1 10:15am (Invited)
Routes toward efficient harmonic generation of coherent x-rays with femtosecond and attosecond duration, Ivan Christov, *Sofia Univ., Bulgaria*.

The talk will review recent advances and discuss future prospects for generation of coherent x-rays by tabletop laser-based systems. We consider some approaches for increasing the efficiency of high-harmonic generation and attosecond pulse generation by using sub-10 fs laser pulses in guided structures.

TuT2 10:45am (Invited)
X-ray laser research at the Advanced Photon Research Center, Yoshiaki Kato, *Japan Atomic Energy Res. Inst., Japan*.

A new laboratory, Advanced Photon Research Center (APRC), dedicated to development and application of ultrashort pulse high power lasers, has started operation in Kyoto in September 1999. Development of compact x-ray lasers, together with the overall activities of APRC including high field science using a 100 TW, 19 fs, 10 Hz Ti:sapphire laser, will be presented.

TuT3 11:15am (Invited)
On the path towards a carbon inner-shell x-ray laser, L.B. Da Silva, P.M. Celliers, F.A. Weber, S.J. Moon, *Lawrence Livermore Natl. Lab., USA*.
Inner-shell x-ray lasers offer the potential of short wavelength with sub-ps pulses. We will report on our progress in developing a carbon soft x-ray laser which would operate at 45 Å. In this scheme x-rays generated by a 30 fs laser pulse are used to photoionize an inner-shell electron and produce inversion.

TuT4 11:45am
Demonstration of a tabletop laser at 52.9nm in neon-like chlorine, M. Frati, M. Seminario, J.J. Rocca, *Colorado State Univ., USA*.
We report the demonstration of laser amplification at 52.9nm in a plasma column generated by a very compact capillary discharge. Laser output pulses with energy up to 10uJ were obtained. The beam divergence was measured to be ~ 4 mrad.

